EPIZOIC OYSTERS ON KIMMERIDGIAN AMMONITES

by JOHN C. W. COPE

ABSTRACT. Oyster distribution on certain Kimmeridgian ammonites is consistent with attachment occurring after the death of the ammonites.

WHILE collecting ammonites from the Upper Kimmeridge Clay at Kimmeridge in Dorset (Cope 1967), it has been observed that the ammonites are often encrusted with oyster shells. This incrustation has been noted on ammonites from almost all horizons throughout the 500 ft. of shales examined, though it rarely occurs on specimens smaller in diameter than 120 mm. Apart from one case in the collection of approximately 500 ammonites, the incrustation of oysters is confined to the underside of the ammonite shells as they lie in the shales.

If the attachment of oyster spat to the ammonite shell occurred during the life of the ammonite (when presumably it was oriented with its sagittal plane in a vertical position as in the living *Nautilus*), the oysters could be expected to be distributed equally on both sides of the shell. In an instance recorded by Seilacher (1960), attachment of oysters to both flanks (and also to the tabulate venter) of the Upper Cretaceous genus *Buchiceras* is described in which the oysters show a marked slope orientation which confirms that, in this case, attachment and growth occurred on the living ammonite.

In the case of the Kimmeridge Clay ammonites examined, however, the absence of oyster growth on the one side of the shell can best be explained on the assumption that the oyster spat became attached to the ammonite after the death of the latter, when the ammonite shell had settled on the sea-floor (where ammonite conchs would be, in fact, the only objects available for attachment).

Medcof (1955) has shown that Recent oyster larvae prefer to settle on under-surfaces of objects, and the form of the Kimmeridgian ammonite conchs would seem to have allowed spat to seek out such surfaces.

Practically all the ammonites in the section at Kimmeridge are crushed, but if an uncrushed shell of similar original whorl shape and similar strong primary ribbing on the body-chamber is placed on a plane surface, it is seen that there are only two areas in actual contact with that surface. These are (i) adjacent to the peristome, and (ii) opposite this, half a whorl back from the peristome. The other parts of the last whorl, and also the whole umbilical area, do not rest in contact with the surface. In the case of an ammonite shell of this shape lying on the sea-bed, oyster spat would have been able to attach themselves to the under-surface except at the two areas where the shell actually rested in contact with the sea-bed.

The distribution of the oyster shells on the ammonite shells from the Kimmeridge section is generally in agreement with such an hypothesis (see Pl. 2). The area of the peristome and that diametrically opposite to it are usually free from incrustation by oysters. Where incrustation does occur at the supposed areas of contact, it is clear that the

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umbonal areas (i.e. the areas of original attachment) of the oysters are not within the areas of contact. It can be supposed that growth by the oyster into the area of contact would not be impossible, since at the time of deposition the Kimmeridgian sea-floor would have been soft.

This fact in itself might appear likely to have inhibited the entry of oyster spat below the shell, as the ammonite shells might have been expected to sink into the sea-bed on first settling on it. Considering, however, that after the death of the free-swimming ammonite the empty shell would only gradually become sufficiently waterlogged to sink to the sea-floor, its ultimate 'touch-down' might be very light indeed, so that it need not necessarily sink in. Once established, the oysters themselves presumably set up enough current action to keep the umbilical space beneath the ammonite free of sediment for an appreciable time. Certainly many of the oysters appear to have reached maturity before burial, so deposition must have been slow. There appears to be some tendency for immature oysters to be conspicuous around the ventral margins of the ammonites, and these may have attached themselves later and been killed by encroaching sediment.

The ammonites and oysters are often both heavily pyritized. However, the apparently normal growth of the benthonic oysters precludes the possibility that anaerobic conditions existed on the sea-floor itself, and the pyritization must have occurred at a later time.

Apart from their existence as epizoans on the ammonite shells, these oysters do not appear in the Kimmeridge Clay and it seems that their development was dependent entirely on the presence of vacated ammonite shells on the sea-floor for the provision of sheltered sites for attachment and growth.

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EXPLANATION OF PLATE 2

Fig. 1. *Pectinatites* (*Virgatosphinctoides*) *elegans* Cope, BM C. 73729, showing attached specimens of *Ostrea bononiae* Sauvage and *O. multiformis* Koch and Dunker. Note the absence of epizoic growth in the peristomal region and that diametrically opposite it. ×0·65.

Fig. 2*a*. *P.* (*V.*) *reisiformis densicostatus* Cope, BM C. 73730, showing incrustation of *O. multiformis*. In this case although the peristomal region is clear, the area diametrically opposite it has been covered by the oyster growth. Note, however, that no oyster was primarily attached within this latter area. ×0·7.

Fig. 2*b*. Reverse side of the specimen depicted in Fig. 2*a*, to show the upper side of the ammonite as it lay in the rock. Note the complete lack of oysters. The obscured areas of the shell are where it is heavily encrusted with pyrite aggregates. ×0·35.

Both the figured specimens are deposited in the British Museum (Natural History).